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Grassflies of the family Chloropidae (Diptera) on Mediterranean islands

Злаковые мухи семейства Chloropidae (Diptera) на островах Средиземного моря

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One hundred sixteen species of Chloropidae (Diptera) are recorded from several Mediterranean islands: 66 on Sardinia, 46 on Sicilia, 45 on the Balearic Islands, 39 on the Maltese Islands, 31 on Corsica, 22 on Cyprus and 6 on Crete. The number of species recorded depends more on the level of knowledge of fauna than on the area of the islands. The recorded species belong to no less than ten chorotypes, most of them, to Euro-Mediterranean, Macaronesian-Mediterranean or Mediterranean chorotypes. Two species, *Lasiambia aterrima* (Duda) and *Oscinimorpha tenuirostris* (Duda), are known on islands and in North Africa (Tunisia) but not recorded from mainland Europe. Two species are East Mediterranean, *Tricimba meridiana* Dely-Draskovits and *Trachysiphonella pori* Harkness et Ismay. *Scoliophthalmus trapezoides* Becker and *Anacamptoneurum obliquum* Becker, which are recorded only from Cyprus, are distributed also in Africa, Arabia and the Oriental Region. Five species are up-to now found only on islands. This review includes 22 species (16 valid), which have type localities on the islands.

На островах Средиземного моря найдено 116 видов злаковых мух (Chloropidae): 66 видов на Сардинии, 46 – на Сицилии, 45 – на Балеарских о-вах, 39 – на Мальтийских о-вах, 31 – на Корсике, 22 – на Кипре и только 6 – на Крите. Число обнаруженных видов определяется степенью изученности фауны, а не площадью острова. По типу распространения найденные виды принадлежат не менее, чем к 10 хоротипам; большинство из них имеют евро-средиземноморский, макаронезийско-средиземноморский или средиземноморский тип ареала. Два вида – *Lasiambia aterrima* (Duda) и *Oscinimorpha tenuirostris* (Duda) – известны с островов и из Северной Африки (Тунис), но не отмечены в материковой части Европы. Два вида – *Tricimba meridiana* Dely-Draskovits и *Trachysiphonella pori* Harkness et Ismay – имеют восточносредиземноморский тип ареала. *Scoliophthalmus trapezoides* Becker и *Anacamptoneurum obliquum* Becker, которые найдены только на Кипре, распространены также в Африке, Аравии и Ориентальной области. Пять видов известны только с островов. Для 22 видов, из которых 16 в настоящее время валидные, на рассматриваемых островах расположены типовые местности.

Key words: grassflies, distribution, range types, review, Mediterranean islands, Diptera, Chloropidae

Ключевые слова: злаковые мухи, распространение, типы ареалов, обзор, острова Средиземного моря, Diptera, Chloropidae

INTRODUCTION

Investigations of island faunas deal with many general problems of ecology and biogeography, especially the composition of insular faunas. The biogeographical theory of MacArthur and Wilson (MacArthur & Wilson, 1967) is based mostly on research of island faunas. Some authors (Gressit, 1955; Gilbert, 1980; Chernov, 1982) considered local ecological conditions as more important for biodiversity of insular faunas. The material on Chloropidae of some (mostly large) Mediterranean islands obtained in the last decades by the author and other dipterists allows one to evaluate the biodiversity of grassflies on these islands.

The Chloropidae is a species-rich dipteran family characterized by high biological diversity. Many chloropid species are phytophagous with larvae developing in shoots and seeds of grasses and sedges (Poaceae and Cyperaceae), many use rotting tissues of plants, fungi, decaying wood, excrements, frass and eggs of spiders and insects, nests of birds and arthropods and even live and dead vertebrates as substrates for development (Ferrar, 1987; Ismay & Nartshuk, 2000). Most species of Chloropidae are rather small in size, and they were often found during trapping of air-borne insects (Yoshimoto et al., 1962; Yoshimoto & Gressit, 1963).

There are no special publications that review insular faunas of Chloropidae. However, Chloropidae collected from many islands of the World Ocean were studied by several researchers, mostly by Sabrosky (1952, 1955, 1957, 1962, 1976, 1977, 1978, 1997), also by Bezzi (1928), Frey (1945, 1949, 1958), Frey & Stora (1937), Wheeler & Forrest (2002, 2003) and others. Some new species, including endemic ones, were described from islands.

All Mediterranean islands are situated close to mainland Europe. They were united with the mainland in prehistoric times and some of them connected Europe with North Africa in the past. The Messinian salinity crisis and desiccation of the entire Mediterranean basin dated to 5.96 ± 0.02 million years ago in the Upper Miocene (Krijgsman et al., 1999). The first fossil Chloropidae are known from the Eocene Baltic amber (Hennig, 1965; Tschirnhaus & Hoffeins, 2009). The fossil Chloropidae from the Miocene are still undescribed, but more or less diverse Chloropidae fauna probably had existed at that time. The Balearic Islands, Corsica, Sardinia, Sicily, Malta and Cyprus were connected with the mainland Eurasia during the Middle Pleistocene, at the Calabrian and Sicilian stages (Gratsianskiy, 1971).

All large islands except Cyprus are formally assigned to Europe, but Cyprus, to Asia. Location of islands in different parts of the Mediterranean Sea, different size of islands and their different history may be of interest to analyze their Chloropidae fauna.

MATERIAL

The paper reviews the published data and the unpublished material identified by the author. The following publications were used in the paper: for the Balearic Islands, Ebejer (2006) and Carles-Tolrá & Ventura (2009); for Corsica, Becker et al. (1910) and Séguy (1934); for Crete, Nartshuk (1984); for Cyprus, Georghiou (1977) and Nartshuk (1990, 2010b); for the Maltese Islands, Ebejer (2010); for Sardinia, Nartshuk (1995a, 2009b, 2011) and Merz (2005); for Sicily, Bezzi & De Stefani-Perez (1897) and Nartshuk (1995a).

In addition to these published data, the material was used collected from Sardinia, Cyprus, Sicilia and Corsica and sent to the author for identification. The author also identified the material from Mediterranean islands in the following European museums: Finnish Museum of Natural History (Helsinki), Museum of Zoology of the Lund University, Museum für Naturkunde (Berlin), Zoologische Staatssammlung München, Naturhistorisches Museum Wien.

Chloropidae of some small islands of Italy and Greece are practically unknown, only few species were recorded from these

islands. *Oscinimorpha longirostris* (Loew, 1858) and *Elachiptera bimaculata* (Loew, 1845) were described from Rhodos, *Chlorops lucens* Becker, 1910, from Paros (Greece), and a small list was published for Capri (Italy) (Nartshuk, 2005). Therefore these islands are not discussed.

RESULTS AND DISCUSSION

A total of 116 species is recorded on the islands under study. For a few species only the generic name is known. The list of species with the data on their distributions by islands is given in Table 1; some quantitative data are summarized in Table 2 and in the Figure. The islands under consideration are arranged according to the size of the territory in the following order: Sicily, Sardinia, Cyprus, Corsica, Crete, the Balearic Islands, and the Maltese Islands. The number of known species does not correspond with the square of island. The greatest number of species is recorded from Sardinia. This reflects the large size of the island, its diverse habitats and geology and the fact that Sardinia has been the subject of special investigation (Nardi et al., 2011). The Chloropidae of Crete are the least known. The same is also true for the fauna of Greece in comparison with the faunas of Spain (without the Canarian Islands) and Italy (see Figure).

Species of the subfamilies Siphonellopsinae and Rhodesiellinae, which are not numerous in the European fauna, are represented by only one species each. Species of the subfamily Oscinellinae predominate over species of the subfamily Chloropinae. The numbers of species of Siphonellopsinae: Rhodesiellinae: Oscinellinae: Chloropinae are in the ratio 1: 1: 71: 43. This ratio agrees with the data on the Chloropidae fauna of

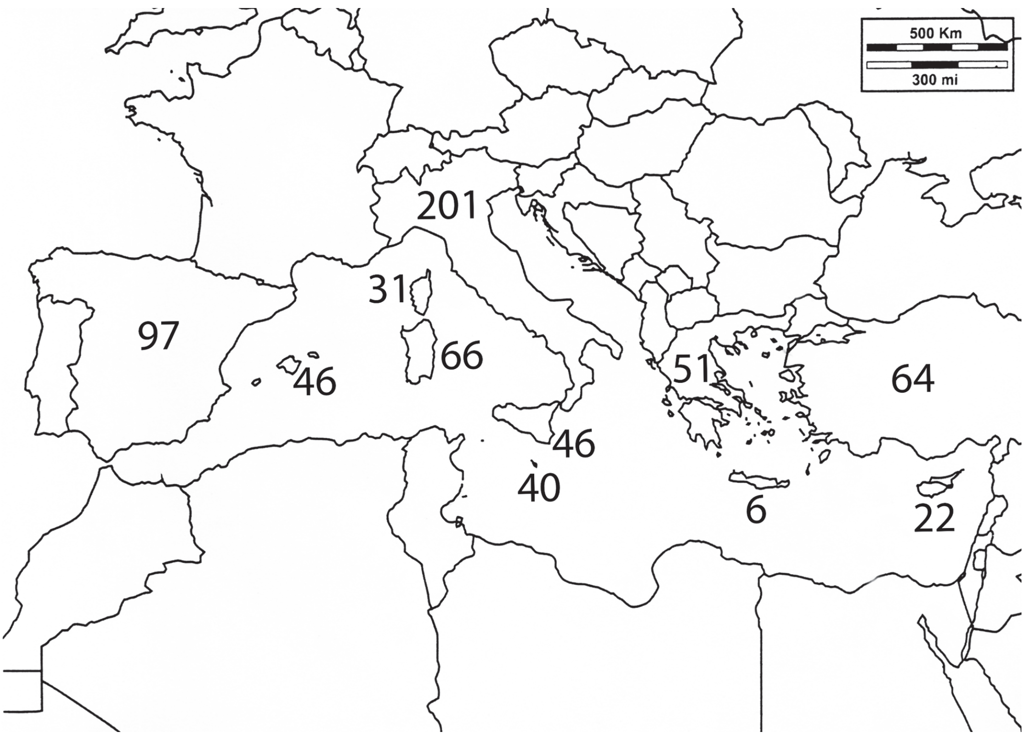


Figure. Number of species of Chloropidae (Diptera) recorded up to now on islands and peninsulas of the Mediterranean [for details, see Tables 1, 2 and text; data on Turkey are taken from Nartshuk (2012a)].

other islands, for example, the islands of Macaronesia (Nartshuk, 1995b) and some others (Nartshuk, 2012b). There may be two explanations for this phenomenon. First, species of the subfamily Oscinellinae are generally smaller in size in comparison with species of the subfamily Chloropinae, and are therefore more likely to be abundant in aerial plankton where they have better opportunities for dispersal to other territories. Second, most of the species of Oscinellinae are saprophagous or phytosaprophagous, and are therefore less influenced by the presence of specific host plants than are species of Chloropinae, which are usually phytophagous and associated with more specific host plants. These peculiarities may give to the Oscinellinae a greater chance for colonization of new areas.

The Chloropidae fauna on all the examined islands is relatively rich. The number of species found on the islands comprises 57.7% of the species number recorded in Italy, 201 species (Nartshuk, 1995a, 2009a, 2009b; Merz, 2005) and is superior to the fauna of Spain except Canary Islands, 97 (De Bruyn & Baez, 2002; Nartshuk, 2004), and Greece, 51 (Nartshuk, 2010a). The examined islands are situated near Europe, and some of them have been connected with the mainland in the past. The fauna of Chloropidae of distant oceanic islands is usually more meager (Nartshuk, 2012b). Some species have been described from the islands mentioned in this review, and 16 of these 22 species are considered valid taxa. However, although their type localities are situated on the islands, many of these species are now known to have a more extensive distribution. Some species occur on all (*Thaumatomyia notata*) or nearly all the islands (*Elachiptera bimaculata* and *Oscinella frit*, on six islands; *E. megaspis*, *Speccafrons halophila*, *Trachysiphonella ruficeps*, *Tricimba humeralis*, *Assuania thalhammeri*, *Eutropha fulvifrons* and *Pseudopachychaeta pachycera*, on five islands). Six of them belong to Oscinellinae and four to Chloropinae. These species have a very wide distribution.

The distribution ranges of chloropid species occurring on the Mediterranean islands are diverse. Seven chorological elements were earlier distinguished within the Chloropidae fauna of Cyprus (Nartshuk, 1990). A similar diversity of range types was observed in chloropids occurring on all other Mediterranean islands. Six species have a multiregional distribution, 9 species have a Holarctic distribution, 9 species are transpalaearctic, 16 ones are Euro-Asian, 42 species have Euro-Mediterranean, Macaronesian-Mediterranean or Mediterranean distribution ranges, and 5 species occur in southern Europe, Mediterranean area and to the east as far as Kazakhstan, Central Asia and Afghanistan. Two species, *Tricimba meridiana* and *Trachysiphonella pori*, are known only from the Eastern Mediterranean. *Scoliophthalmus trapezoides* has a mainly Afrotropical distribution and is known also from Israel. *Anacamptoneurum obliquum* is known from Africa, Arabia, India, Turkey and Israel. Most of species have a Euro-Mediterranean or Mediterranean distribution. *Scoliophthalmus trapezoides* and *Anacamptoneurum obliquum* occur only on Cyprus. Each of the five species, *Lasiambia parallela* from Crete, *Lasiosina laminata* from Corsica, *Aphanotrigonum lanceolatum* and *Dicraeus sardous* from Sardinia, and *Speccafrons cypria* from Cyprus, are known from only one island. *Elachiptera sarda* described from Sardinia probably occurs also on the Balearic Islands (M.J. Ebejer, pers. comm.). Some of these species eventually may be found on other islands or in mainland Spain, Italy, southern France, Greece and Turkey. The faunas of Chloropidae of the Balearic Islands, Corsica, Sardinia, Sicily and the Maltese Islands are by their nature mainly Mediterranean; some Afrotropical and Arabo-Oriental elements appear only in the fauna of Cyprus. In general, the Chloropidae on the Mediterranean islands represent the same pattern of chorological elements as chloropids from the Mediterranean mainland areas, except for the five species known from one island only (see above).

Table 1. List of Chloropidae species on islands of the Mediterranean.

	Subfamilies and species	Authors	Year	*Bal*	*Cor*	*Sar*	*Sic*	*Mal*	*Cre*	*Cyp*	Chorotypes
	Siphonellopsinae										
1	*Siphonellopsis lacteibasis*	Strobl	1906			+	+				Mediterranean
	Rhodesiellinae										
2	*Scoliophthalmus trapezoides*	Becker	1903							+	Near East, Afrotropical
	Oscinellinae										
3	*Anacamptoneurum obliquum*	Becker	1803							+	Africa, India, Arabia
4	*Aphanotrigonum anderssoni*	Nartshuk	2003					+			Mediterranean
5	*Aphanotrigonum bicolor*	Nartshuk	1964			+		+			Mediterranean-Turanian
6	*Aphanotrigonum favillaceum*	(Becker)	1903							+	Macaronesian, Mediterranean
7	*Aphanotrigonum femorellum*	Collin	1945	+		+		+			Euro-Mediterranean
8	*Aphanotrigonum inerme*	Collin	1964	+				+			Euro-Mediterranean
9	*Aphanotrigonum lanceolatum*	Nartshuk	2008			+					Sardinia
10	*Aphanotrigonum parahastatum*	Dely-Draskovits	1981			+		+	+		Mediterranean, Afghanistan
11	*Aphanotrigonum* sp.					+					
12	*Calamoncosis duinensis*	(Strobl)	1909	+		+		+			Euro-Asian
13	*Calamoncosis minima*	(Strobl)	1893	+				+			Transpalaearctic
14	*Calamoncosis stipae*	Nartshuk	1962	+							South-Euro-Mediterranean
15	*Calamoncosis* sp.			+							
16	*Conioscinella frontella*	(Fallén)	1820		+						Transpalaearctic
17	*Conioscinella gallarum*	Duda	1932			+					Transpalaearctic
18	*Conioscinella mimula*	Collin	1946			+					Euro-Mediterranean
19	*Dicraeus nigropilosus*	Becker	1910		+	+	+				Euro-Mediterranean
20	*Dicraeus raptus*	(Haliday)	1838		+	+	+				Euro-Mediterranean
21	*Dicraeus sardous*	Nartshuk	2008			+					Sardinia
22	*Dicraeus tibialis*	(Macquart)	1835			+	+				Holarctic

Table 1. Continued.

	Subfamilies and species	Authors	Year	*Bal*	*Cor*	*Sar*	*Sic*	*Mal*	*Cre*	*Cyp*	Chorotypes
23	*Elachiptera bimaculata*	(Loew)	1845	+	+	+	+	+		+	Macaronesian, Mediterranean
24	*Elachiptera cornuta*	(Fallén)	1820	+	+	+		+			Transpalaearctic
25	*Elachiptera megaspis*	(Loew)	1858		+	+	+	+		+	Macaronesian, Mediterranean
26	*Elachiptera rufifrons*	Duda	1932	+		+					Euro-Mediterranean
27	*Elachiptera sarda*	Nartshuk	2008	+		+					Sardinia and Balearic Islands
28	*Gaurax* sp. 1					+					
29	*Gaurax* sp. 2					+					
30	*Incertella albipalpis*	(Meigen)	1830			+	+				Transpalaearctic
31	*Incertella zuercheri*	(Duda)	1932	+				+			Euro-Asian
32	*Lasiambia albidipennis*	(Strobl)	1893			+					Euro-Mediterranean
33	*Lasiambia aterrima*	(Duda)	1933	+							Balearic Islands and Tunis
34	*Lasiambia brevibucca*	(Duda)	1933			+					Euro-Mediterranean
35	*Lasiambia fycoperda*	(Becker)	1910		+	+	+				Mediterranean
36	*Lasiambia palposa*	(Fallén)	1820	+				+			Euro-Asian
37	*Lasiambia parallela*	(Becker)	1910						+	+	Crete
38	*Lasiambia* sp.						+				
39	*Lasiochaeta pubescens*	(Thalhammer)	1898	+	+	+		+			Euro-Mediterranean to Afghanistan
40	*Lipara lucens*	Meigen	1830	+	+		+	+			Euro-Asian
41	*Lipara rufitarsis*	Loew	1858	+	+			+			Holarctic
42	*Lipara similis*	Schiner	1864	+	+						Euro-Mediterranean
43	*Oscinella frit*	(Linnaeus)	1758	+	+	+	+	+		+	Multiregional
44	*Oscinella nartshukiana*	Beschovski	1978	+				+			Mediterranean, Africa, Arabia and Near East

Table 1. Continued.

	Subfamilies and species	Authors	Year	*Bal*	*Cor*	*Sar*	*Sic*	*Mal*	*Cre*	*Cyp*	Chorotypes
45	*Oscinella nitidigenis*	(Becker)	1908				+	+			Macaronesian, Mediterranean
46	*Oscinella* sp. aff. *nitidigenis*			+							
47	*Oscinella nitidissima*	(Meigen)	1838			+		+			Holarctic
48	*Oscinella pusilla*	(Meigen)	1830	+		+	+	+			Transpalaearctic
49	*Oscinella ventricosi*	Nartshuk	1956	+				+			Euro-Mediterranean
50	*Oscinella vindicata*	(Meigen)	1830					+			Transpalaearctic
51	*Oscinimorpha albisetosa*	(Duda)	1932			+	+				Euro-Asian
52	*Oscinimorpha arcuata*	(Duda)	1932	+		+				+	Euro-Mediterranean
53	*Oscinimorpha longirostris*	(Loew)	1858	+		+	+	+			Macaronesian, Mediterranean
54	*Oscinimorpha minutissima*	(Strobl)	1900			+	+	+			Euro-Asian
55	*Oscinimorpha novakii*	(Strobl)	1893		+	+		+		+	Macaronesian, Mediterranean
56	*Oscinimorpha tenuirostris*	(Duda)	1933	+							Balearic Islands and Tunis
57	*Oscinisoma cognatum*	(Meigen)	1830				+				Euro-Asian
58	*Polyodaspis picardi*	Seguy	1946	+				+	+	+	Mediterranean
59	*Polyodaspis ruficornis*	(Macquart)	1835				+				Multiregional
60	*Polyodaspis sulcicollis*	(Meigen)	1838	+		+	+	+		+	Euro-Asian
61	*Siphunculina ornatifrons*	(Loew)	1858	+			+			+	Subcosmopolitan
62	*Speccafrons cypria*	Nartshuk	1990							+	Cyprus
63	*Speccafrons halophila*	(Duda)	1932	+	+	+	+	+			Euro-Mediterranean
64	*Speccafrons* sp. aff. *costalis*			+							
65	*Trachysiphonella carinifacies*	Nartshuk	1964			+					Euro-Mediterranean-Turanian
66	*Trachysiphonella pori*	Harkness et Ismay	1976							+	East-Mediterranean
67	*Trachysiphonella ruficeps*	(Macquart)	1835	+	+	+	+	+			Euro-Mediterranean

Table 1. Continued.

	Subfamilies and species	Authors	Year	*Bal*	*Cor*	*Sar*	*Sic*	*Mal*	*Cre*	*Cyp*	Chorotypes
68	*Trachysiphonella scutellata*	(von Roser)	1840			+	+				Euro-Asian
69	*Tricimba cincta*	(Meigen)	1830			+	+				Holarctic
70	*Tricimba humeralis*	(Loew)	1858	+		+	+	+		+	Euro-Asian
71	*Tricimba lineella*	(Fallén)	1820			+					Holarctic
72	*Tricimba meridiana*	Dely-Draskovits	1983							+	East-Mediterranean
73	*Tricimba* sp.			+		+					
	Chloropinae										
74	*Assuania thalhammeri*	(Strobl)	1893		+	+	+	+		+	Euro-Mediterranean
75	*Camarota curvipennis*	(Latreille)	1805	+		+	+			+	Euro-Mediterranean
76	*Capnoptera pilosa*	Loew	1866				+				Mediterranean
77	*Capnoptera scutata*	(Rossi)	1790			+					Mediterranean
78	*Cetema cereris*	(Fallén)	1820		+						Transpalaearctic
79	*Cetema myopinum*	(Loew)	1866				+				Euro-Asian
80	*Chlorops geminatus*	Meigen	1830			+	+				Euro-Asian
81	*Chlorops emiliae*	Smirnov	1967						+		Euro-Mediterranean-Kazakhstanian
82	*Chlorops gracilis*	Meigen	1830			+	+				Euro-Asian
83	*Chlorops hypostigma*	Meigen	1830			+					Transpalaearctic
84	*Chlorops interruptus*	Meigen	1830			+	+				European
85	*Chlorops laetus*	Meigen	1830	+							Euro-Mediterranean-Kasakhstanian
86	*Chlorops novakii*	Strobl	1902			+	+				Euro-Asian
87	*Chlorops pannonicus*	Strobl	1893			+	+				Euro-Asian
88	*Chlorops pumilionis*	(Bjerkander)	1778			+	+				Euro-Asian
89	*Chlorops puncticornis*	Loew	1866			+	+				European
90	*Chlorops scalaris*	Meigen	1830	+							Euro-Asian
91	*Chlorops serenus*	Meigen	1830			+	+				Euro-Mediterranean
92	*Chlorops socius*	Becker	1912			+	+				Euro-Mediterranean

Table 1. Continued.

	Subfamilies and species	Authors	Year	*Bal*	*Cor*	*Sar*	*Sic*	*Mal*	*Cre*	*Cyp*	Chorotypes
93	*Chlorops troglodytes*	(Zetterstedt)	1848		+			+			Euro-Asian
94	*Cryptonevra flavitarsis*	(Meigen)	1830	+	+			+			Transpalaearctic
95	*Cryptonevra nigritarsis*	(Duda)	1933	+				+			Euro-Kazakhstanian
96	*Diplotoxa messoria*	(Fallén)	1820		+						Holarctic
97	*Diplotoxoides dalmatina*	(Strobl)	1900		+						Euro-Mediterranean
98	*Eurina calva*	Egger	1862			+	+				Euro-Mediterranean
99	*Eurina ducalis*	A. Costa	1885	+	+	+					Euro-Mediterranean
100	*Eurina lurida*	Meigen	1830	+	+						Euro-Mediterranean
101	*Eutropha fulvifrons*	(Haliday)	1833	+	+	+	+	+			Euro-Mediterranean
102	*Lasiosina herpini*	(Guérin-Méneville)	1843	+	+	+					Transpalaearctic
103	*Lasiosina immaculata*	Becker	1912			+					Euro-Mediterranean
104	*Lasiosina laminata*	Duda	1933		+						Corsica
105	*Meromyza femorata*	Macquart	1835			+	+				European
106	*Meromyza nigriseta*	Fedoseeva	1960					+			Euro-Asian
107	*Meromyza nigriventris*	Macquart	1835		+	+	+				Holactic
108	*Meromyza* sp.					+				+	
109	*Meromyza variegata*	Meigen	1830			+	+				European
110	*Pseudopachychaeta approximatonervis*	(Zetterstedt)	1848		+						Holarctic
111	*Pseudopachychaeta pachycera*	Strobl	1902	+	+	+	+	+			Mediterranean
112	*Thaumatomyia elongatula*	(Becker)	1910		+						Euro-Mediterranean
113	*Thaumatomyia glabra*	(Meigen)	1830					+			Holarctic
114	*Thaumatomyia notata*	(Meigen)	1830	+	+	+	+	+	+	+	Multiregional
115	*Thaumatomyia rufa*	Macquart	1835		+		+			+	Transpalaearctic
116	*Thaumatomyia sulcifrons*	(Becker)	1907			+	+		+	+	Transpalaearctic

Abbreviations: *Bal*, the Balearic Islands; *Cor*, Corsica; *Sar*, Sardinia; *Sic*, Sicily; *Mal*, the Maltese Islands; *Cre*, Crete; *Cyp*, Cyprus.

Table 2. Number of species of Chloropidae in different subfamilies on islands and in some countries of the Mediterranean.

Subfamilies	*Bal*	*Cor*	*Sar*	*Sic*	*Mal*	*Cre*	*Cyp*	Spain	Italy	Greece
Siphonellopsinae	1	0	1	1	0	0	0	3	2	0
Rhodesiellinae	0	0	0	0	0	0	1	1	1	0
Oscinellinae	33	14	40	23	30	3	15	39	91	32
Chloropinae	11	17	25	22	9	3	6	54	107	19
Total	45	31	66	46	39	6	22	97	201	51

Note. Spain including Balearic Islands but excepting Canary Islands, Italy including Sardinia and Sicilia, and Greece including Crete. Abbreviations as in Table 1.

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